PB-217 938

IMMEDIATE WATER POLLUTION CONTROL NEEDS. NORTHWEST CHESAPEAKE BAY AREA (PATAPSCO TO SUSQUEHANNA DRAINAGE BASINS IN MARYLAND)

Federal Water Pollution Control Administration
Charlottesville, Virginia

August 1967

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U. S. DEPARTMENT OF COMMERCE
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I. INTRODUCTION

A. Purpose and Scope

The waters of Chesapeake Bay, when explored by Captain John Smith in 1608, supported an abundance of fish and shellfish with shorelines endowed with natural harbors and bounded with fertile lands. Development of the agricultural resources and fisheries, growth of cities and shipping, and extensive recreational use of the Bay has not as yet caused a significant degradation of water quality in the Bay proper, but there has been increasing evidence of pollution problems in the river inlets. It is the purpose of this study to examine those areas along the northwestern part of the Bay, extending from the Patapsco to the Susquehanna Rivers, and to provide the following information on the basis of the best available information:

1. Locate present and potential water quality problem areas and evaluate the need for corrective action.
2. Identify pollution sources and determine the parties responsible.
3. Present immediate pollution control needs, responsibilities, and costs.

The foregoing objectives are the initial steps in a more comprehensive program presently in progress.

B. Authority

The Federal Water Pollution Control Act as amended (33 U.S.C. 466 et seq) directed the Secretary of the Interior to develop comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary condition of surface and underground waters.

C. Acknowledgments

In conformance with the Federal Water Pollution Control Act, the cooperation of other Federal, State, and local agencies, industrial representatives, and institutions was sought and is gratefully acknowledged. Recommendations appearing in this study are based upon data from several excellent reports listed in the bibliography and upon carefully considered opinion resulting from conferences with representatives of agencies concerned.

Cooperation was received from individuals and organizations too numerous to be listed, but special mention is merited by the following:

Maryland Department of Water Resources

Maryland Department of Health

Regional Planning Council, State of Maryland

Anne Arundel County Health Department

Baltimore City Health Department

Baltimore City Department of Public Works

Baltimore County Department of Health

Baltimore County Department of Public Works

Howard County Metropolitan Commission

Harford County Metropolitan Commission

Harford County Health Department

II. GENERAL

A. Sources of Information

Present water quality conditions were obtained entirely from the records of State, County, and institutional agencies and included the regular stream and Bay sampling runs where available, the special stream surveys, and the summer surveys at bathing beaches usually conducted by local health agencies. These data were evaluated by the staff of the Chesapeake Field Station after conferences with the several agencies concerned. No sampling was conducted by Chesapeake Field Station personnel except for previous studies on Back River included as part of this report.

Waste water discharge data, both sanitary and industrial, were compiled by the Chesapeake Field Station staff from previous reports and were revised after review of current data from pertinent agencies.

Water supply requirements were not investigated, since the major surface water sources have already been developed, and further water supply sources are either from outside the subject areas or from ground waters.

B. Determination of Needs

Immediate needs were evaluated in terms of the treatment or sewerage required to maintain the most beneficial uses of the watercourses as proposed in the water quality standards

recently approved by the State.[3] In general, the Chesapeake Bay-Susquehanna River Basins Project has recommended secondary treatment (85 per cent BOD removal) for sanitary wastes and an equivalent for industrial wastes, with consideration of factors delineated in the general water quality criteria of the State.[3] Stream reaches upstream from water supply reservoirs were not included, since adequate sanitary control of their watersheds was already in effect.

III. SUMMARY AND CONCLUSIONS

A. Findings

Since the study area included a number of river basins large and small, the detailed study was made using political boundaries. To some extent this offered the advantage of delineating responsibilities for water quality surveillance, planning, and enforcement, as well as reducing the large number of stream basins to be considered separately.

Water quality data, except for the area near Baltimore City, were largely unavailable and were primarily based upon bathing beach surveys during the past two years. Sewage treatment plant operating data, except for the two Baltimore City plants and a 1964 FWPCA survey[12] with limited data, were also lacking. A tabulation of industrial waste sources was initiated with limited information based upon a 1964 questionnaire, but a more comprehensive inventory is necessary, and a recommendation to accomplish this is included in this study.

A wealth of information to effect improvements in water quality was found in the several consulting engineers' reports listed in the Bibliography. These reports furnished the bases for immediate construction needs, although there were several modifications required to coordinate the programs, evaluate the relative priorities, and make realistic construction cost estimates.

No consideration was given to the upper reaches of the larger streams--the Patapsco River and Gunpowder Falls. Both are used for water supply, and the consequent sanitary control in the Liberty, Loch Raven, and Prettyboy Reservoirs preclude gross water pollution problems. For a similar reason, the Susquehanna River above the Conowingo Dam was also omitted but is the subject of a separate report.[20]

B. Immediate Pollution Control Needs

1. Waste Treatment

The immediate needs, as evidenced from the water quality data available, were for sewage treatment facilities to achieve corrective action for the untreated and partially treated waste discharges where existing water quality did not meet the approved State standards.[3] The several recommendations in the consulting engineers' reports for the various agencies were reviewed and modified to some extent in favor of fewer, larger sewage treatment plants. All of the larger population centers in the subject area can be served by three sewage treatment plants--the existing Baltimore City facilities at Patapsco and Back River, and the Harford County Sod Run plant now under construction. Highest priorities should be given to expansion of these facilities and construction of the intercepting sewers to convey sewage to these locations. High priorities should be assigned also to

intercepting sewers at locations where deterioration in water quality has been identified.

The total cost for immediate pollution control needs is estimated as $69,000,000. This does not include cost of studies recommended, desirable actions not directly related to water pollution control, nor provision of general area sewerage to ameliorate local nuisance conditions. A summary of the construction needs with estimated construction costs is given in Table I.

2. Flow Regulation

Existing reservoirs in the Gunpowder and Patapsco Basins were developed for water supply, and any releases would have as primary purposes fish survival and aesthetic values in the downstream park developments. Some benefit to water quality would accrue incidentally but is not considered in this study.

Since Baltimore already draws 110 mgd from the Susquehanna River at Conowingo Reservoir to augment its water supply, available flow regulation releases from these Basins would be nominal.

With increasing use of the Susquehanna River for water supply by Baltimore, Havre de Grace, and other municipalities outside Maryland, flow regulation for this purpose and for fish survival will be required and is included as a study recommendation in the Susquehanna River Study.[20]

3. Special Studies

Additional water quality and pollution control studies are needed in the Basin to provide more data for comprehensive evaluations. Recommended studies are summarized in Table II, and the more significant needs are discussed below.

a. Nutrients

There is a developing need to determine existing conditions in the upper Chesapeake Bay Area with respect to nutrient content, including studies of the possible accelerating effects increasing nutrient contributions from waste treatment plants and agricultural run-off may have on eutrophication. The investigation should include not only the Bay proper with its estuaries, but also upstream reaches of its tributaries, and especially those that drain agricultural areas. This study could be made in cooperation with the Chesapeake Research Council. The Office of Estuarine Studies, FWPCA, should be involved for coordination with similar projects, and the Chesapeake Field Station water quality field studies should include determinations of nutrient content.

b. Waste Inventories

In attempting to relate water quality to probable pollution sources, Chesapeake Field Station personnel found the waste inventories in the subject Area were either unavailable or outdated, especially for industrial wastes. This responsibility

rests jointly upon Maryland Department of Health and Maryland Department of Water Resources. While the Field Station will continue to gather all waste data available, assistance from the aforementioned State agencies is essential to preparation of the comprehensive program for pollution abatement in the Area.

c. Sludge Disposal

The problem of sludge disposal in the large municipal sewage treatment plants has become increasingly serious as the availability of lands for disposal decreased. The demand for dried sludge for use as a soil conditioner is limited, with areas for large area disposal too remote to be economically feasible. Odors resulting from the drying process have been a source of complaint. The alternative disposal methods suggested have been incineration, which may aggravate an existing air pollution problem, and sludge disposal at sea, which required a large capital outlay and a long haul to the Gulf Stream in the ocean to insure that the sludge will not wash ashore to become a nuisance at shore points. It is recommended that the feasibility of sludge disposal at sea through a pipeline be investigated, preferably as a Baltimore-Washington cooperative enterprise.

d. Thermal Pollution

Thermal pollution of the upper Bay Area has not as yet become as significant an ecological problem as it has in other areas of Chesapeake Bay. However, a recommendation to initiate studies of the effect of thermal discharges for the Bay and its estuaries is an immediate need.

TABLE I

IMMEDIATE CONSTRUCTION NEEDS

Location	Responsibility	Need	Cost
Patapsco Sewage Treatment Plant	Baltimore City	Add primary capacity, add secondary treatment	$10,000,000
Back River Sewage Treatment Plant	Baltimore City	Add capacity and rehabilitate plant. (Includes outfall and and pumping station at Moore's Run.)	$20,000,000
Patapsco Interceptor	Anne Arundel County, Baltimore County, Howard County	Eliminate waste discharges into Patapsco River, divert Patuxent Basin sewage.	$4,500,000
Oliver Beach Interceptor	Baltimore County	Divert sewage flows from Gunpowder River to Back River Sewage Treatment Plant.	$1,100,000
Interceptors and Pumping Stations for: Gray Manor Chesaco Park Pennwood Terrace Old Battle Grove Hyde Park Stansbury Manor	Baltimore County	Divert sewage leaking to Back and Middle Rivers to Back River Sewage Treatment Plant.	$2,100,000
Cox Creek Sewage Treatment Plant	Anne Arundel County	Add to capacity and provide secondary treatment.	$3,500,000
Marley Neck Interceptor	Anne Arundel County	Construct a parallel force main to Cox Creek Sewage Treatment Plant to increase capacity.	$600,000

TABLE I (Continued)

Location	Responsibility	Need	Cost
Edgewood-Sod Run Interceptor	Harford County Metropolitan Commission	Divert sewage from Edgewood Arsenal Sewage Treatment Plant to Sod Run Sewage Treatment Plant.	$2,750,000
Perryman-Sod Run Interceptor	Harford County Metropolitan Commission	Divert sewage from temporary Perryman Sewage Treatment Ponds to Sod Run Sewage Treatment Plant.	$800,000
Bel Air-Long Bar Harbor Interceptor	Harford County Metropolitan Commission	Divert Bel Air sewage to sewerage system serving Sod Run Sewage Treatment Plant.	$3,000,000
Swan Creek Sewage Treatment Plant	Harford County Metropolitan Commission	Interim secondary treatment.	$350,000
White Marsh Interceptor	Baltimore County	Divert sewage from the upper Gunpowder River Basin to Back River Sewage Treatment Plant.	$900,000
Jones Falls Pumping Station	Baltimore City	Increase capacity to eliminate discharge of raw sewage to Jones Falls.	$750,000
Port Deposit	Port Deposit	Provide secondary treatment.	$150,000
Herring Run Interceptor	Baltimore City	Add capacity to eliminate raw sewage discharges.	$300,000
Southwest Diversion Sewer	Baltimore City	Eliminate sewage discharge into Gwynns Falls.	$10,000,000

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TABLE I (Continued)

Location	Responsibility	Need	Cost
Lilly Run Sewer Separation	Havre de Grace	Separate sanitary and storm sewage for existing combined system.	$500,000
Community Interceptors at: Bynum Run, Wildcat Branch, Winter's Run, Little Gunpowder, Cranberry Run addition	Harford County	Divert untreated or inadequately treated sewage to Sod Run to protect respective streams.	$2,500,000
County Line Interceptor	Anne Arundel County, Howard County	Eliminate waste discharges into Deep Creek, provide capacity for diversion of Patuxent sewage.	$3,000,000
Conowingo	Cecil County	Add secondary treatment.	$30,000
Havre de Grace Sewage Treatment Plant	Havre de Grace	Add secondary treatment.	$300,000
Separate sewerage	Baltimore City	Complete separation of storm and sanitary sewerage.	$1,000,000
Cooper Branch Sewage Treatment Plant	Baltimore County	Eliminate plant by connecting to Patapsco Interceptor.	$250,000
Forge Heights Sewerage	Baltimore County	Interceptor to divert sewage to Forge Heights Sewage Treatment Plant.	$700,000
TOTAL			$69,080,000

TABLE II

IMMEDIATE SPECIAL STUDY NEEDS

Location	Responsibility	Need
Chesapeake Bay and Tidal Tributaries	Chesapeake Research Council, Office of Estuarine Studies, and FWPCA	Determination of present nutrient loadings, potential capacity and the feasibility of controlled nutrient enrichment for increased shellfishery production without accelerating area eutrophication.
Chesapeake Bay Drainage Basin	Maryland Department of Water Resources and Maryland Department of Health	Compilation of municipal and industrial waste inventory to include load, capacity, degree of treatment and efficiency with special problems in industrial waste discharges identified.
Baltimore City Sewage Treatment Plants	Baltimore City	Feasibility study of methods of nutrient removal from treated effluents to reduce rate of eutrophication where significant in receiving waters.
Baltimore Harbor	Department of Chesapeake Bay Affairs and FWPCA	Study of pollution from boats with emphasis on methods of control of pollution from commercial vessels by legislation, shipboard holding, or treatment and shore disposal.
Chesapeake Bay and Tidal Tributaries	Chesapeake Research Council and FWPCA	Determination of the limits of thermal discharges without significant ecological changes.
Chesapeake Bay and Tidal Tributaries	Maryland Department of Health and Maryland Department of Water Resources	Development of high reliability industrial waste and sewage treatment plant operations to assure no adverse effect upon shellfishing waters.
Baltimore City Sewage Treatment Plants (in cooperation with other problem areas)	FWPCA	Investigation of the feasibility of pumping sludge to the Gulf Stream by means of pipeline with possibility of diversion to adjacent agricultural areas for soil conditioning.

TABLE II (Continued)

Location	Responsibility	Need
U. S. Army: Aberdeen Proving Ground Edgewood Arsenal	Department of Defense and FWPCA	Investigate feasibility of ultimate elimination of sewage treatment plants by discharge of wastes to a community sewerage system.
Chesapeake Bay Communities: Havre de Grace Aberdeen Joppatowne	Regional Planning Council and Harford County Metropolitan Commission	Determine the feasibility of extending interceptors to divert sewage from these communities to the Sod Run Sewage Treatment Plant in lieu of separate treatment facilities now in operation and the corresponding increase of capacity in the plant.

IV. BASIN DESCRIPTION

This study area represents in its entirety an economy centered in the urban-industrial complex of Baltimore, with suburban area environs and extending to rural agriculture to the north and east. It includes all of Baltimore City and County and Harford County; parts of Anne Arundel, Howard, and Carroll Counties; and even that small area of Pennsylvania containing the headwaters of the Gunpowder River Basin. That part of the Susquehanna River Basin in Maryland is also included in this study with its small drainage area in Cecil County.

The critical areas with pollution problems are largely in the Coastal Plain geophysical province. The Fall Line separating this from the Piedmont province is close to the head of tide of the several estuaries along this northwestern shore of Chesapeake Bay, and above this Line the characteristic rolling country of the Piedmont is evident. Aside from the suburban communities near Baltimore, the Piedmont portion of the study area is primarily agricultural.

The primary drainage basins to be considered are the Patapsco, Back, Gunpowder, Bush, and Susquehanna Rivers, but the analysis for immediate needs requirements is based on a political boundary rather than drainage basin because of the several small tidal streams that are adjacent to the basins.

The Patapsco River provides the fine harbor which was instrumental in the development of Baltimore as the State's largest City, the excellent port facilities, and the industrial center. Industry and suburban development followed the course of the River upstream, but nearer the headwaters the country is rural.

The Back and adjacent Middle Rivers developed as suburbs, although some industrial growth occurred at their heads of tide due to their proximity to Baltimore. Waterfront recreation and living are predominant here.

Gunpowder River and Falls, with the tributaries Little Gunpowder Falls and Bird River, have not appreciably changed their rural characters, and there has been a concerted effort to develop the lower stream shores for park and recreational use. The estuary has several bathing beaches, and the headwaters are in agricultural areas with two reservoirs constructed for water supply to the City of Baltimore.

The Bush River drainage area is small, and the land use is rural. Except for the large Federal installations of the U. S. Army at Edgewood Arsenal and the Aberdeen Proving Ground, there is little industry. These Federal activities occupy practically all of the Chesapeake Bay shore front from Bush River northward to the Susquehanna River.

The Susquehanna River Area contains the larger communities of Aberdeen and Havre de Grace but is otherwise rural in character. This River is the primary source of fresh water to Chesapeake Bay, providing 65 per cent of the flow and maintaining a low salinity in the Area during most of the year.

V. RECENT PROGRESS IN POLLUTION CONTROL

In accordance with the Federal Water Pollution Control Act, the State of Maryland has approved and adopted water quality standards for all waters.[3] In addition, a program of implementation has been proposed[4] based upon amendments to the Annotated Code of the State requiring all Counties and the independent City of Baltimore to submit a program of improvement of water quality in their respective areas by 1970.

Maryland Department of Water Resources and Maryland Department of Health are jointly charged with the responsibility of reviewing these programs, with the former especially directed toward problems involving industrial wastes and the latter, sanitary wastes.

A special committee has recommended creation of a Waste Acceptance Service[27] to receive and treat all municipal and industrial wastes generated in the State. This recommendation is now under study by a consulting engineer under contract. A new law was passed by the Maryland Legislature requiring examination and certification of all waste treatment plant operators effective June 1, 1968.

During July 1967, construction of the Sod Run Sewage Treatment Plant near Perryman was started. It is anticipated that, in accordance with present plans and the recommendations contained herein, the sewage treatment requirements for the entire subject area can be met with this and the Baltimore City plants.

VI. IMMEDIATE NEEDS

A. General Needs

As noted previously, detailed analyses of problems and needs in the study area were divided in accordance with political boundaries instead of stream basins because of the many small streams which are direct tributaries of Chesapeake Bay. This division also offers the advantage of fixing general responsibility for action in accordance with the plan for implementation for corrective action.[4] There are, however, the following immediate needs for special studies that are generally applicable to the entire study area.

1. Eutrophication of Chesapeake Bay

The ultimate aim of protecting the ecology of the Bay can be achieved by the several actions to enhance and maintain the proposed water quality standards[3] in the tributaries and embayments. However, a general study of the Bay areas with special emphasis on the historic and present nutrient content; the past, present, and prospective nutrient loadings; and their contributions toward accelerating eutrophication will also be required as an immediate need. Some special surveys have been made[26] that appear to indicate that the existing nutrient content in Bay waters is high enough to maintain the historical ecological balance. However, there is a need for determining the nutrient capacity beyond which eutrophication will be accelerated. The study should include an investigation of shellfishery potential

that can be achieved by controlled addition of nutrients from treated waste effluents in specific areas.

The Chesapeake Research Council would be the recommended coordinating agency for the study, cooperating with the Office of Estuarine Studies, FWPCA, to their mutual advantage. The Chesapeake Field Station will include nutrient determinations with water quality investigations in the upper Bay area where a field sampling program has already been scheduled.

2. Municipal and Industrial Waste Inventory

Proposals for corrective action to improve water quality depend upon the availability of information on all waste discharges, treated or untreated. The limited information available is incomplete and, to a great extent, outdated because of recent progress by local governmental agencies. The responsibility for this inventory lies with the Maryland Department of Health for sanitary discharges and municipal sewage treatment plant data and with the Maryland Department of Water Resources for industrial waste discharges and treatment data. It is recommended that these agencies cooperate with the Chesapeake Field Station in preparing a complete waste inventory for the entire State.

3. Advanced Waste Treatment

Some evidence of accelerated eutrophication was found in a study of the Back River Area[12] and, contingent upon the

findings of a general study of the Chesapeake Bay Area as recommended, additional problems in over-enrichment of Area waters from treated sewage effluents may be found. It is recommended that provision be made for addition of advanced waste treatment facilities at the larger sewage treatment plants. In addition, various methods of nutrient removal should be studied for economic feasibility, including that of industrial re-use of the effluent as currently practiced at the Back River Sewage Treatment Plant.

4. Boat Pollution Investigations

The relative importance of pollution from boats has not been resolved. The Chesapeake Field Station is continuing a program of field studies on pleasure boat pollution with inconclusive results because of high background pollution. In addition to these studies, some investigation is required of the pollution problem from commercial shipping in Baltimore Harbor. Legislative restrictions on indiscriminate waste discharge from vessels in the Harbor are recommended for adoption by the State based upon a uniform policy to be suggested by FWPCA. There is an indication that Federal legislation may be required to effect control in interstate commerce.

5. Thermal Pollution Studies

An investigation of the ecological effects of thermal discharges from industrial cooling is required to determine the

capacity of receiving waters for each discharge location. This study should be referred to the Chesapeake Research Council to determine the institution to conduct each specific study and coordinate the findings with those of other locations and with the Office of Estuarine Studies, FWPCA.

6. Sewage Treatment Plant Reliability Study

The increasing trend toward large waste treatment plants with outfalls to Chesapeake Bay is becoming a threat to existing shellfish growing areas where rigid water quality standards must be maintained. The alternatives to duplication of treatment facilities, which may result in excessively high costs, should be explored to arrive at a feasible method to guard against breakdown of equipment and accidents in operations. These alternatives could include automatic monitoring of effluents, emergency holding facilities, emergency chlorination equipment, and high reliability equipment for all stages of treatment.

7. Sludge Disposal

This has become a problem not only in Baltimore, but also in other large cities where urban and suburban growth has preempted site locations for sludge disposal. A study of alternate means of disposal is recommended, with pipeline disposal to the ocean as discussed in further detail under the Baltimore City specific needs.

8. Federal Installations, U. S. Army

The extensive shore front activities at Edgewood Arsenal and Aberdeen Proving Grounds have limited the areas available for sewage treatment plants in the Harford County Area, and a large plant to serve the Area is now under construction on the Proving Grounds under agreement. A study to explore the feasibility of diverting all sewage from these installations for treatment at the Sod Run Sewage Treatment Plant is recommended.

9. Extension of Intercepting Sewers to the Sod Run Sewage Treatment Plant

The existing sewage treatment plants serving Havre de Grace, Aberdeen, and Joppatowne vary from poor to good in performance. A feasibility study to divert sewerage from these locations to a central treatment plant is recommended.

B. Specific Needs

A general discussion of needs by political divisions follows to supplement and furnish more detail than given in the Summary. No cost figures are provided for construction needs, since they are included in the Summary, and cost figures are not included for special studies recommended because of their indeterminate nature at this time. Responsibilities for action are also included in the tables in the Summary.

1. Anne Arundel County

The recent consulting engineer's study for Anne Arundel County[5] offers adequate solutions for waste problems in the Patapsco drainage areas, and the proposed interceptors to carry sewage to the Baltimore City Patapsco Sewage Treatment Plant should be considered as joint ventures with adjacent counties, where applicable. Tentative plans to divert sewage from part of the Patuxent River drainage basin also provide feasible methods of reducing nutrient loadings to that already critically loaded River, and this too should be achieved by cooperative action by Howard and Baltimore Counties to construct intercepting sewers.

Water quality in the Patapsco outer harbor area appears to be fairly good based upon the limited data available, and no immediate construction needs are recommended for that Area. The inner harbor does receive industrial discharges from Anne Arundel County of relatively unknown quality and quantity, and an inventory of such discharges should be included in the requirement of a general waste inventory to be prepared by the Maryland Department of Water Resources. Examination of inner harbor water quality data regularly made by Baltimore City does not show any nonconformity with approved State standards. However, the sampling points are located well out into the Harbor where considerable dispersion and dilution have already occurred.

The existing primary sewage treatment plant at Cox Creek is inadequate, but additions to capacity and secondary treatment facilities (at a total cost of $2,062,000) are presently under construction and should provide adequate capacity until 1975.

The Riviera Beach Area is now served by an intercepting sewer with a pumping station to discharge all sewage to the Cox Creek Sewage Treatment Plant.

2. Howard County

The problem of pollution in the Patapsco River by discharges from Elkridge and Ellicott City has been in existence for some time[7, 8, 9] and prompted a consulting engineers' study[15] to develop a feasible corrective program. An intercepting sewer to serve this Area was proposed and is an acceptable means of conveying the sewage from Howard and Baltimore Counties to the Patapsco Sewage Treatment Plant in Baltimore. Part of this interceptor has been completed to a temporary treatment facility below Ellicott City, but the remainder to the Baltimore City interceptor at Washington Boulevard is presently under design. Prompt completion of this interceptor is an immediate need for water quality improvement in the Patapsco River.

The consulting engineers' report also recommends diversion of sewage from the Patuxent River drainage basin to the Patapsco because of inadequate capacity in that Basin. Inclusion of an intercepting sewer along Deep Creek to serve both

Anne Arundel and Howard Counties in the Patapsco Basin and construction of a pumping station and force main to divert Patuxent Basin sewage are included as high priority immediate needs.

3. Baltimore City

Sixty-three per cent of the cost of all immediate water pollution control needs in the study area is for Baltimore City projects. The more significant needs are as follows:

a. Waste Treatment Plants

Most of the consulting engineers' studies have provided that at least part of the sewage from surrounding counties be treated at one of the two existing sewage treatment plants operated by the City. In these proposals there can be no disagreement, since the discharges into the Patapsco inner harbor and Back River can be controlled with adequate treatment to provide effluents that will allow approved standards to be met. Considerable savings in sewage interceptor costs can be made by sharing of costs by the City and the several Counties, and this joint construction action is recommended. The two Baltimore sewage treatment plants will then comprise two-thirds of the proposed eventual treatment plants for the study area and offer the advantages of large operational economy and effluent quality control. Expansion and rehabilitation of both plants are included as high priority immediate needs with details as follows:

(1) Patapsco Sewage Treatment Plant - This plant provides primary treatment only for an approximate flow of 10 mgd. As an immediate need, the capacity should be doubled and secondary treatment provided to afford capacity and satisfactory treatment for the additional sewage load from Howard, Baltimore, and Anne Arundel Counties, as well as to enhance the degraded water quality in Baltimore's inner harbor.[7,8,9] In addition, provision should be made for location of advanced waste treatment facilities that may be required from proposed nutrient studies of the Harbor and Bay.

(2) Back River Sewage Treatment Plant - This plant was constructed in 1911 and has performed well in providing secondary treatment to approximately 160 mgd of sewage from Baltimore City and County. Contributing to the lack of problems in the receiving waters attributable to this plant has been the sale of effluent for industrial use by the Sparrows Point Plant of the Bethlehem Steel Company.[12] In view of the proposals to divert additional sewage from Baltimore County to this plant and the age of existing facilities, enlargement and major rehabilitation of this plant is recommended as an immediate need with the highest priority. This location should also provide a site for possible advanced waste treatment facilities.

b. Sludge Disposal

Sludge disposal problems for these sewage treatment plants in the Baltimore City Area have become increasingly acute because of odor nuisance and lack of suitable sites for land disposal. The alternative of incineration has been considered and rejected as contributing to an existing air pollution problem. Baltimore City has, therefore, submitted a construction grants request for assistance in providing channel and boat facilities for sludge disposal at sea. This facility cannot be recommended in this study as an immediate need to control water pollution, although it has been asserted that there is leaching from sludge deposits into the River. The previous Back River water quality study[12] does not reveal any discernable pollution from this source but did recommend consideration of dredging a channel in the River to allow greater tidal exchange to reduce the rate of eutrophication.

Use of sludge boats for this Area would require an excessively long trip to reach a desirable location, would lack dependability in maintaining a schedule in adverse weather, and would require rigid inspection and control to assure that no premature or accidental dumping takes place. Costs of operation will be relatively high because of manpower requirements, boat and shore facility maintenance, and emergency storage provisions. The proposed discharge location 20 miles offshore is not adequate to prevent pollution of shorelines.

It is recommended, therefore, that as an immediate need, disposal of sludge by alternative methods be studied with consideration to be given to dewatering to produce a filter cake and to disposal by pumping to the Gulf Stream offshore via pipeline.

Modern sludge dewatering-incineration processes allow preparation of a dry filter-cake that can be disposed of by economic hauling to disposal sites and/or incinerators.

Previous proposals to pump either raw or treated sewage effluents to the Gulf Stream have been considered but rejected thus far because of cost or the effect of diverting treated effluents from the headwaters of estuaries with resultant salinity incursion, but sludge disposal by pipeline may prove feasible.

Pipeline costs can be reduced by joint action with other treatment plants, such as that of the District of Columbia where sludge disposal problems already exist.

Estimates of pipeline and pumping costs can be obtained from the extensive transcontinental lines carrying gas, oil, and suspended solids which have provided an economical means of transporting liquids of sludge consistency.

Pipelines offer a definite point of discharge into the Gulf Stream to achieve vertical dispersion at a point where currents will carry the nutrients away from the shoreline, and the Gulf Stream provides an inexhaustible sink for sludge

solids and can absorb to advantage any dissolved nutrient load available.

c. Sewers and Appurtenances

Intercepting sewers and other projects proposed as immediate needs items supplement existing systems and allow sewage from other areas to be treated in the Baltimore City plants and are considered separately.

(1) The Patapsco Intercepting Sewer should be constructed to serve Baltimore, Anne Arundel, and Howard Counties on an immediate need basis with capacity to meet long-term requirements and to eliminate present pollution of the Patapsco River.[7,8,9]

(2) The Southwest Intercepting Sewer is required to reduce pollution of Gwynns Falls resulting from remaining combined sewer overflows[24] and to provide capacity for area growth. Sampling of urban streams has consistently shown excessively high coliform counts, and coliforms have been a primary source of pollution in the Patapsco River and Baltimore inner harbor.[24]

(3) The Jones Falls Pumping Station is inadequate to prevent discharge of raw sewage overflows into Jones Falls, one of Baltimore City's urban streams.[24] Increasing the capacity of this Station with attendant force main construction is included in the high priority immediate needs.

(4) The West Branch-Herring Run Intercepting Sewer is required to supplement existing interceptors which are

periodically surcharged and to eliminate raw sewage discharges presently found in these urban streams.[24]

These itemized projects include immediate needs as far as they could be determined with the information available. The Regional Planning Council has engaged a consulting engineering firm to prepare a master plan to include abatement of water pollution. The plan is scheduled for completion in early 1968.

Baltimore is the hub of industry in the State of Maryland. An industrial waste inventory is essential for planning corrective action for pollution control in the Area and is a Maryland Department of Water Resources responsibility.

4. Baltimore County

a. Water quality in the Patapsco River is poor as a result of untreated or partially treated discharges.[7,8,9] While many of these wastes originate in Howard County, a significant number of industries in Baltimore County discharge effluents of undetermined quality into the River. The County's Cooper Branch Sewage Treatment Plant near Catonsville provides secondary treatment to area sewage at present but can ultimately be eliminated and the sewage discharged to the Patapsco Interceptor. This has been undertaken as a cooperative project with Howard County, and its completion is recommended as an immediate need.

b. Baltimore County drainage area, tributary to the Patapsco River outer harbor area, is considered separately from the upstream areas, since tidal exchange provides some dilution to effect better water quality. However, the immediate needs involve construction of pumping stations and force mains to protect outer harbor water quality when upstream pollution sources have been abated.

c. The Back River drainage area was the subject of a separate report[12] and the recommended interceptor sewer construction to abate pollution from the tributaries is included as an immediate need in this study. Also included in this report was the recommendation that increase in the industrial use of effluents by the Bethlehem Steel Company be promoted to reduce nutrient discharges, or that the feasibility of advanced waste treatment be investigated.

d. Pollution from unsewered areas exists in the Middle River Sub-Basin[14], and extension of sewerage with construction of pumping stations to serve these areas is recommended.

e. The Bird and Gunpowder River areas have poor water quality, as evidenced by bathing beach sampling[14] and previous studies.[17,18] A survey by the County Health Department, using dye in sanitary fixtures, confirmed the origin as from inadequate private disposal systems. To protect the recreational park facilities along Gunpowder Falls and the bathing beaches in

the Gunpowder River, sewerage along the Creek and adequate treatment are essential as immediate needs. Previous studies have proposed interim treatment at locations downstream from Loch Raven Reservoir, with an ultimate sewage treatment plant at the mouth.[16] The construction of an interceptor along the lower Gunpowder Falls is not recommended at this time as an immediate need because of low population density. Instead, the construction of the Forge Heights and White Marsh Interceptors is proposed, the former to divert sewage to an existing small treatment plant, and the latter to the Back River Sewage Treatment Plant. A pumping station near Joppatowne to divert sewage to either the Back River or Sod Run Sewage Treatment Plants should be considered as an alternative to expansion of the existing Joppatowne plant, perhaps with the ultimate objective of eliminating this plant. A considerable cost saving may be achieved over that of maintaining a separate sewage treatment plant.

5. Harford County

The Harford County Metropolitan Commission has already developed plans for sewerage and sewage treatment in the tidewater and adjacent areas that can be included in the immediate needs study. Most of the shoreline is occupied by Government installations which effectively limits sewage treatment discharge considerations to the Bush River. This discharge location has been studied and rejected as unsatisfactory in providing dilution

for treated effluents. A site on the Aberdeen Proving Grounds was acquired, and the Sod Run Sewage Treatment Plant is now under construction. This plant will discharge its effluent into Romney Creek, a tidal stream and estuary flowing into Chesapeake Bay. It is anticipated that this broad, shallow estuary will serve as a stabilization pond for this effluent and effect some "polishing" action to reduce nutrient content before discharge into the Bay. However, a condition in the agreement with the Federal Government provides that, should nutrients become a problem in Romney Creek, additional treatment will be required.

Bush River has been subject to serious pollution problems in the past[23], but conditions have been improved as a result of the interim stabilization ponds constructed near Perryman, as proposed in an earlier County plan, and corrective actions taken at the Army Chemical Center at Edgewood.

The recommended action to serve immediate needs is to construct interceptors from communities in the Area which are most urgently in need of additional sewage treatment facilities; namely, Bel Air, Perryman, and Edgewood. The latter has been notified that it can no longer continue discharging sewage into the Edgewood Arsenal sewerage system. Other interceptors are required to serve new communities at Wildcat Branch, Winter's Run, Bynum Run Extension, Swan Creek, and Cranberry Run. The remaining immediate construction need is at Havre de Grace, where

discharges from combined sewers and primary treatment have polluted part of the Susquehanna River at some river stages. This community, along with other communities providing primary treatment only, has been notified by the State Department of Health to take corrective action.

Sewer separation and secondary treatment in the Lilly Run Basin are urgently required.

Special studies are recommended as part of this immediate needs report and should be undertaken promptly to avoid unnecessary construction expenditures. The most urgent is the feasibility of extending intercepting sewers from the Sod Run Sewage Treatment Plant to Havre de Grace via Aberdeen. Aberdeen has an adequate treatment plant at present, but prospective peripheral growth will exceed its capacity, and additions to the plant appear less desirable than providing additional capacity at Sod Run. Cooperation of the Aberdeen and Havre de Grace communities could achieve mutual savings in cost of an interceptor and allow the latter to discontinue plans for additional treatment.

Possible elimination of the Joppatowne Sewage Treatment Plant has already been discussed elsewhere, and feasibility of connection to the Sod Run Interceptor should be studied.

While sewage treatment facilities at Federal installations in the Area do not appear to be a problem based upon limited information available, it is recommended that the feasibility of future elimination of sewage treatment facilities at

both the Aberdeen Proving Ground and Edgewood Arsenal be examined. Executive Order No. 11288 declares the disposal of sewage to adequate municipal sewerage to be the preferred method of treatment. Arrangements to deliver Aberdeen Proving Ground sewage via proposed interceptors to the Sod Run Sewage Treatment Plant under construction at the site would permit operations at the Aberdeen Proving Ground Sewage Treatment Plant to be discontinued if a satisfactory agreement could be reached. Similarly, the Edgewood Arsenal sewerage system could be readily adapted to discharge into the proposed Edgewood Community Interceptor.

6. Cecil County

There are just two communities in the Susquehanna Drainage Basin in this County that contribute any significant waste discharges. These are Conowingo, furnishing primary treatment, and Port Deposit with none. Although the River water quality is good in these reaches,[20] secondary treatment should be provided.

VII. INSTITUTIONAL ARRANGEMENTS

The problem of the several separate plans prepared by consulting engineers for the several political jurisdictions has already been resolved by cooperative actions. The existing institutions can, within their frameworks of authority, plan and implement actions for the abatement of pollution in accordance with existing legislation.[4]

Considering the size of the stream basins included in the study area, there is no necessity for formation of basin commissions nor authorities to expedite corrective actions. Any preliminary review of programs can be accomplished competently by the State agencies responsible--Maryland Department of Water Resources and Maryland Department of Health.

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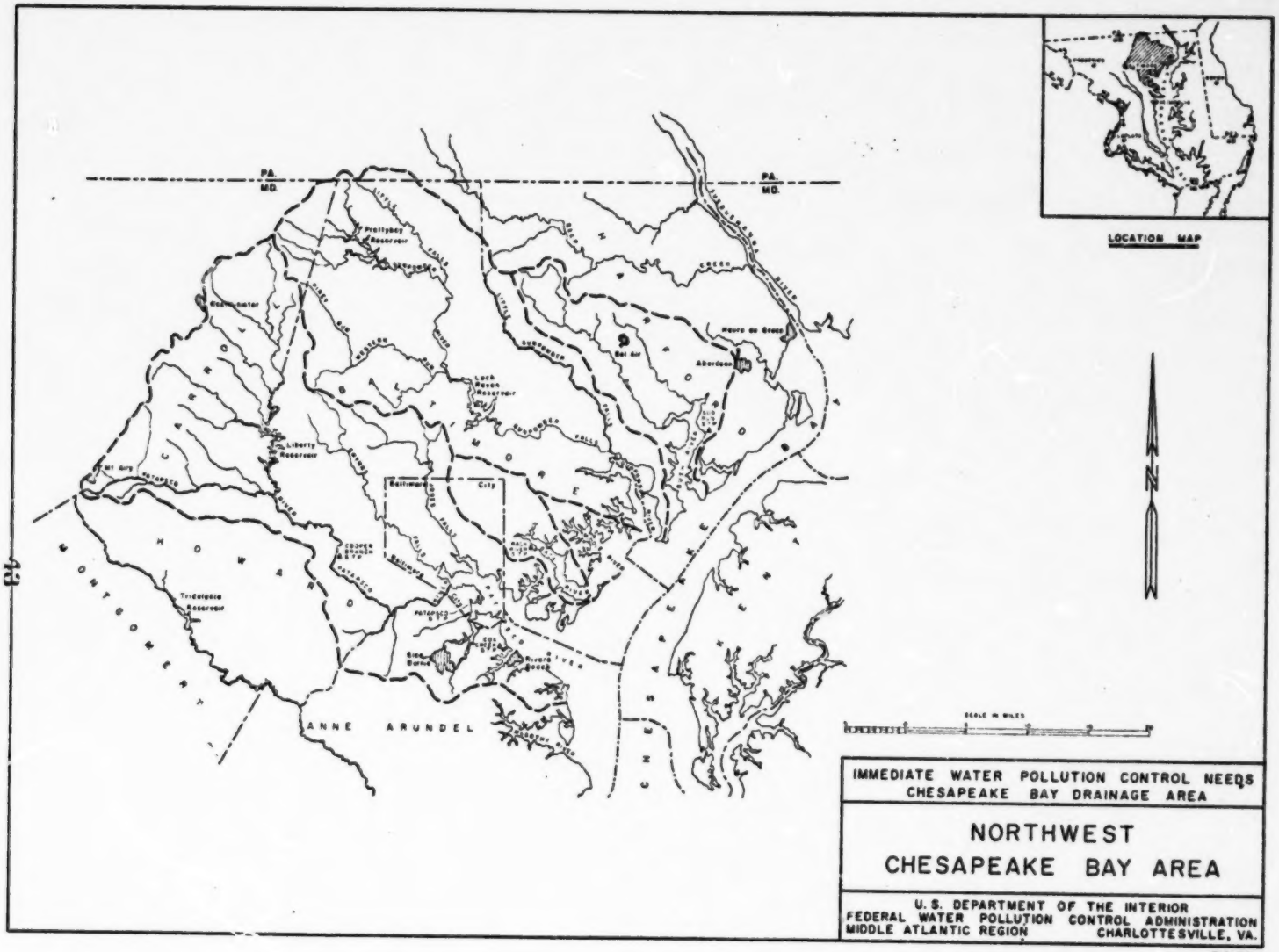

IMMEDIATE WATER POLLUTION CONTROL NEEDS
CHESAPEAKE BAY DRAINAGE AREA

NORTHWEST CHESAPEAKE BAY AREA

U. S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
MIDDLE ATLANTIC REGION CHARLOTTESVILLE, VA.

FIGURE 1